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Performance of Plumbing Vents in the Mark IV and Mark VI Experimental Houses

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NATIONAL RESEARCH COUNCIL OF CANADA

DIVISION OF BUILDING RESEARCH

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549

TECHNICAL NOTE

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DATE

June 1970

PREPARED FOR

Research Committee, NHBA

SUBJECT

PERFORMANCE OF PLUMBING VENTS IN THE MARK IV
AND MARK VI EXPERIMENTAL HOUSES

The Division of Building Research has conducted a number of quantitative studies on some of the innovations introduced into houses constructed under the experimental house program of the National House Builders Association. This Technical Note reports on the studies of the performance of plumbing vents of two of these experimental houses originally carried out by W.F.H. Williamson of DBR.

Two studies were carried out, the first in 1968 on the single-storey Mark IV house located at the Rockcliffe air station in Ottawa and the second on the two-storey Mark VI house located at Kitchener, Ontario in 1969. The purpose of these studies was to determine the effect of vent size on the maintenance of a water seal in the fixture traps.

Mark IV Study

The Mark IV house was a three-bedroom bungalow with basement (Figure 1). All the plumbing fixtures were standard units and consisted of a toilet, a bathtub and basin in the bathroom, a single sink in the kitchen, and a double laundry unit in the basement. Stack vents were arranged so that the fixtures on the ground floor could be tested with no venting or with 1-in., 2-in., or 3-in. vents (Figure 2).

The laundry units could be tested with no venting or with $\frac{1}{2}$ -in. or $1\frac{1}{4}$ -in. vents. The loss of water seal was recorded as fixtures were emptied either individually or with other fixtures.

The greatest loss of water seal occurred with no venting when all fixtures were drained at the same time except the fixture under observation. The basin trap and bathtub trap suffered the greatest loss under these conditions of test. Venting with 1-in., 2-in., and 3-in. vents progressively reduced this loss to less than $\frac{1}{4}$ in. (Figure 3).

The greatest loss of water seal with fixtures operating individually occurred when the toilet was flushed and all vent stacks were closed. Venting with 1-in., 2-in., and 3-in. stacks progressively reduced the loss to negligible amounts (Figure 4).

Repeated flushing of the toilet increased the loss of water in the traps as shown in Figures 5, 6 and 7.

Loss of water in the trap of the laundry tubs, even with no venting, was negligible.

Mark VI Study

The Mark VI house was a two-storey house with basement having a floor plan as shown in Figure 8. The plumbing fixtures consisted of a toilet, a bathtub and basin on the second floor; a toilet and basin in the powder room and a double sink in the kitchen on the ground floor; and a double laundry tub in the basement. All the fixtures were standard plumbing items except the bathtub and basin on the second floor which were moulded FRP units. Stack vents were arranged so that all fixtures on the ground and second floors could be tested with no venting or with 1-in. or 2-in. vents. The laundry units could be tested with no venting or with 1-in. or $1\frac{1}{2}$ -in. vents (Figure 9).

The greatest loss of water seal occurred with no venting and all fixtures, except the one being observed, being drained simultaneously. Results of this test and the tests with 1-in. and 2-in. vents are shown in Figure 10.

Simultaneous flushing of the two toilets with no venting resulted in complete loss of water seal in the kitchen sink. Repeated

flushing of individual toilets with no venting also produced complete loss of water seal in either the bathtub or the powder room basin (Figures 11 and 12). With a 1-in. vent the loss was reduced so that a $1\frac{1}{2}$ -in. water seal was maintained. The 2-in. vent reduced the trap loss still further.

The trap of the laundry tubs was not affected by any combination of flushing or emptying of fixtures even when the system was not vented.

Comments

In the tests only clear water was used; the effects of solids in the waste was not determined. The tests were carried out during warm weather so the effect of frost closure was not determined. The effect of variations in the size of a vent pipe was not investigated.

Under the conditions of these tests, 1-in. and larger vents prevented a break of the water seal in the traps of all fixtures and a water seal of $1\frac{1}{2}$ -in. was maintained. In both houses, the loss of water in the trap of the laundry tubs in the basement was negligible regardless of degree of venting or number and sequence of fixtures operating.

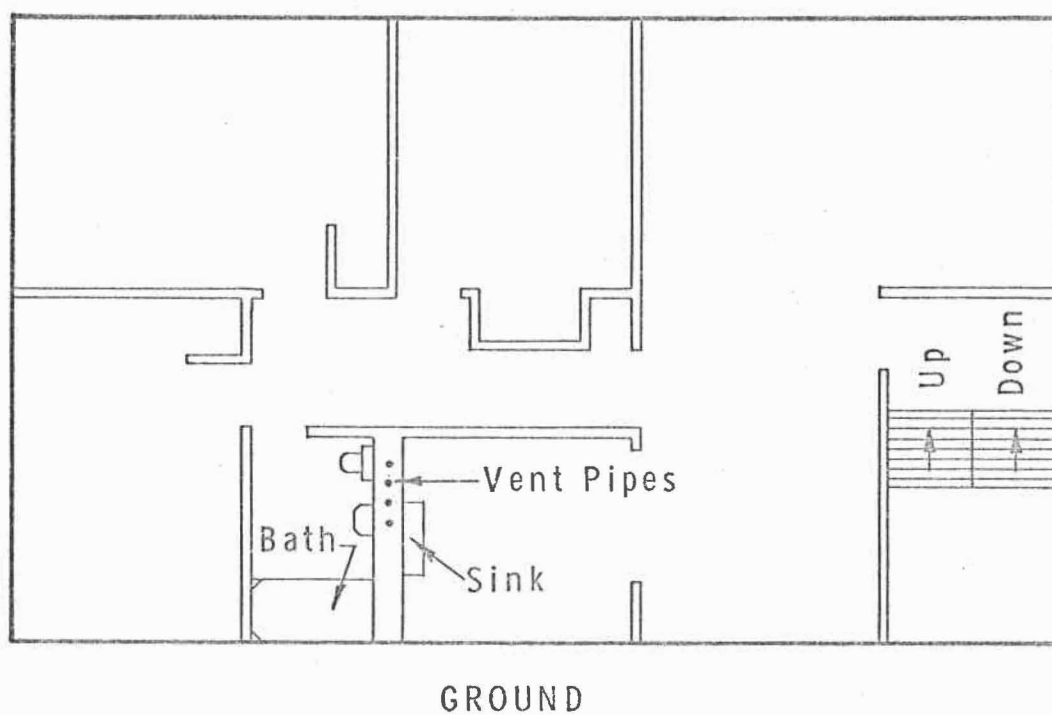
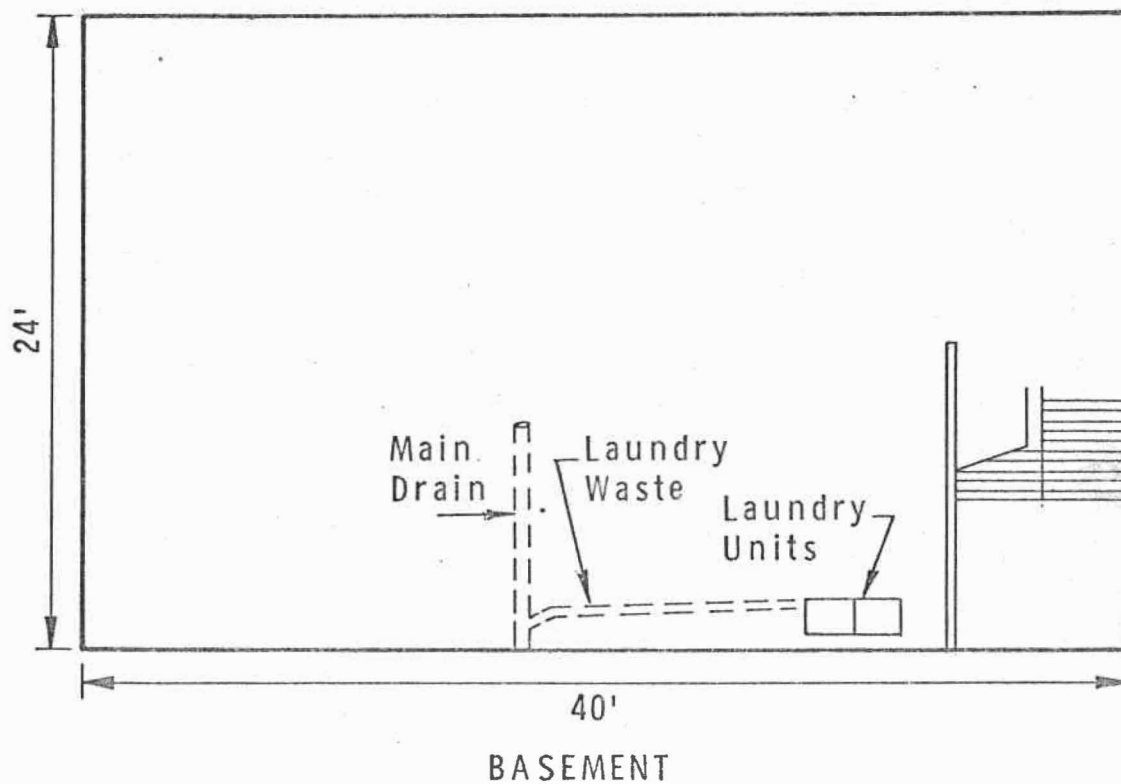


FIGURE 1
FLOOR PLANS, MARK IV HOUSE

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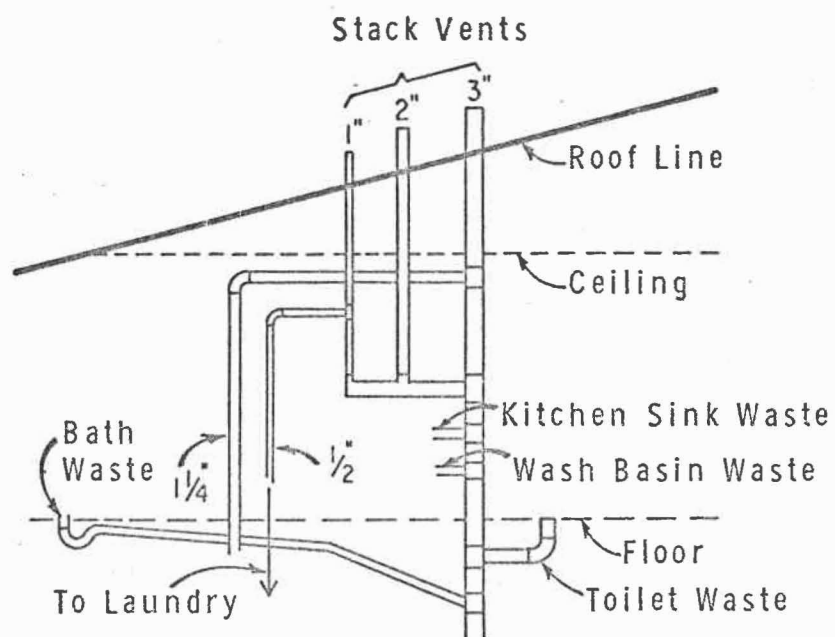


FIGURE 2
ARRANGEMENTS OF WASTE AND VENT PIPES IN
COMMON WALL

58 4272-2

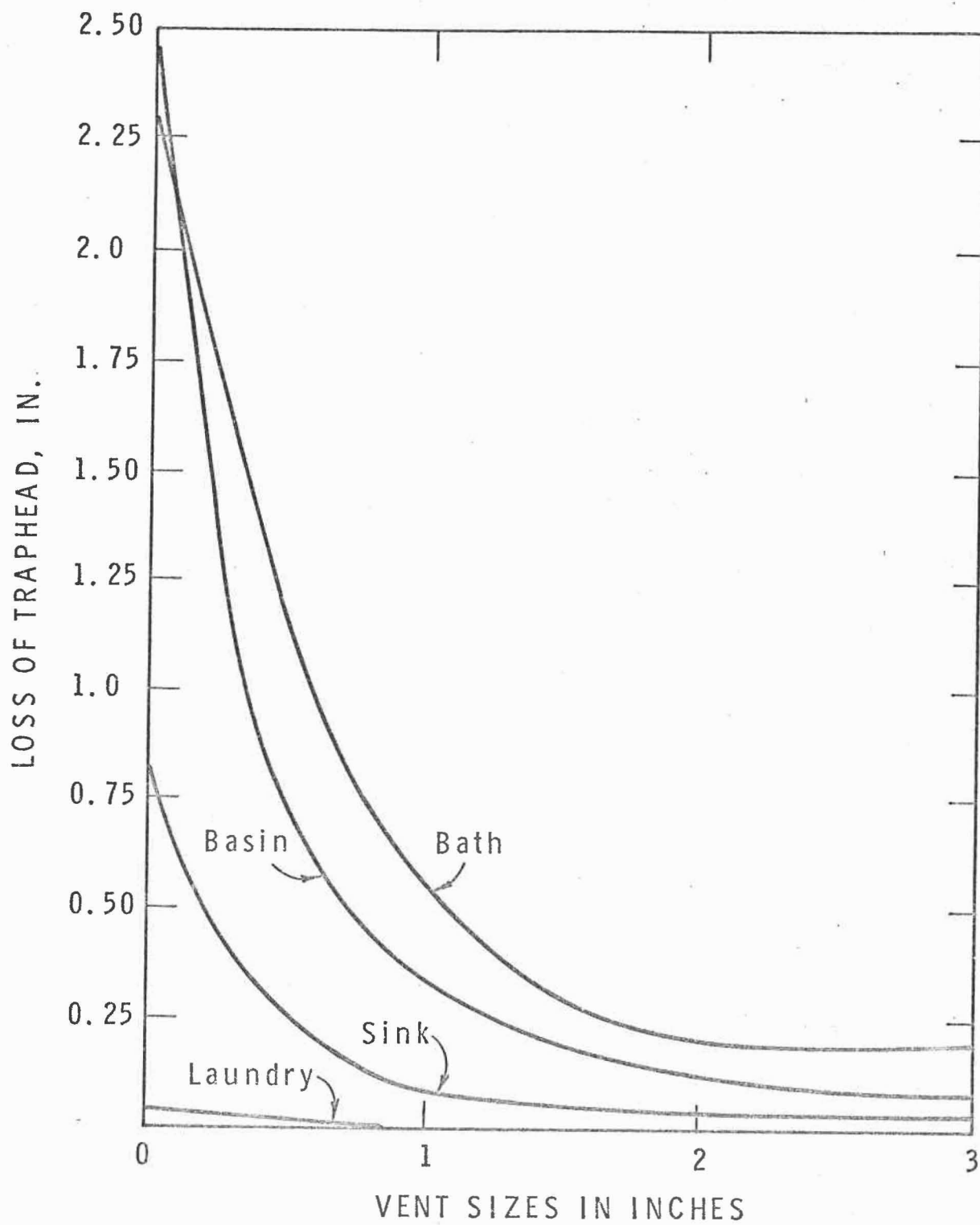


FIGURE 3

MAXIMUM TRAP LOSSES. RESULTS OF VENTING ON EACH UNIT WITH ALL OTHER FIXTURES OPERATING

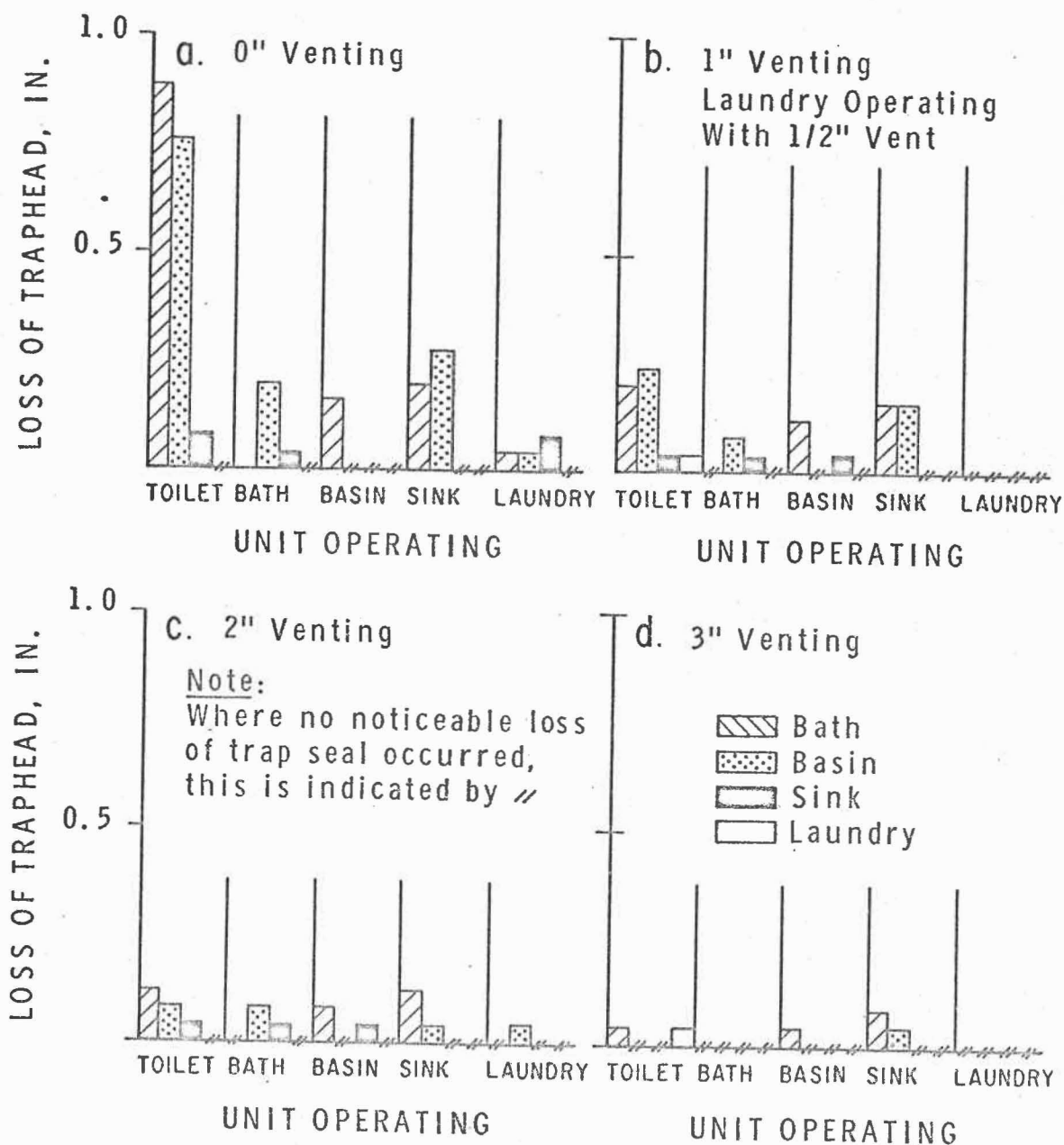


FIGURE 4

THE EFFECT ON TRAP SEALS WITH ONLY ONE FIXTURE OPERATING AND WITH VARIOUS VENTING

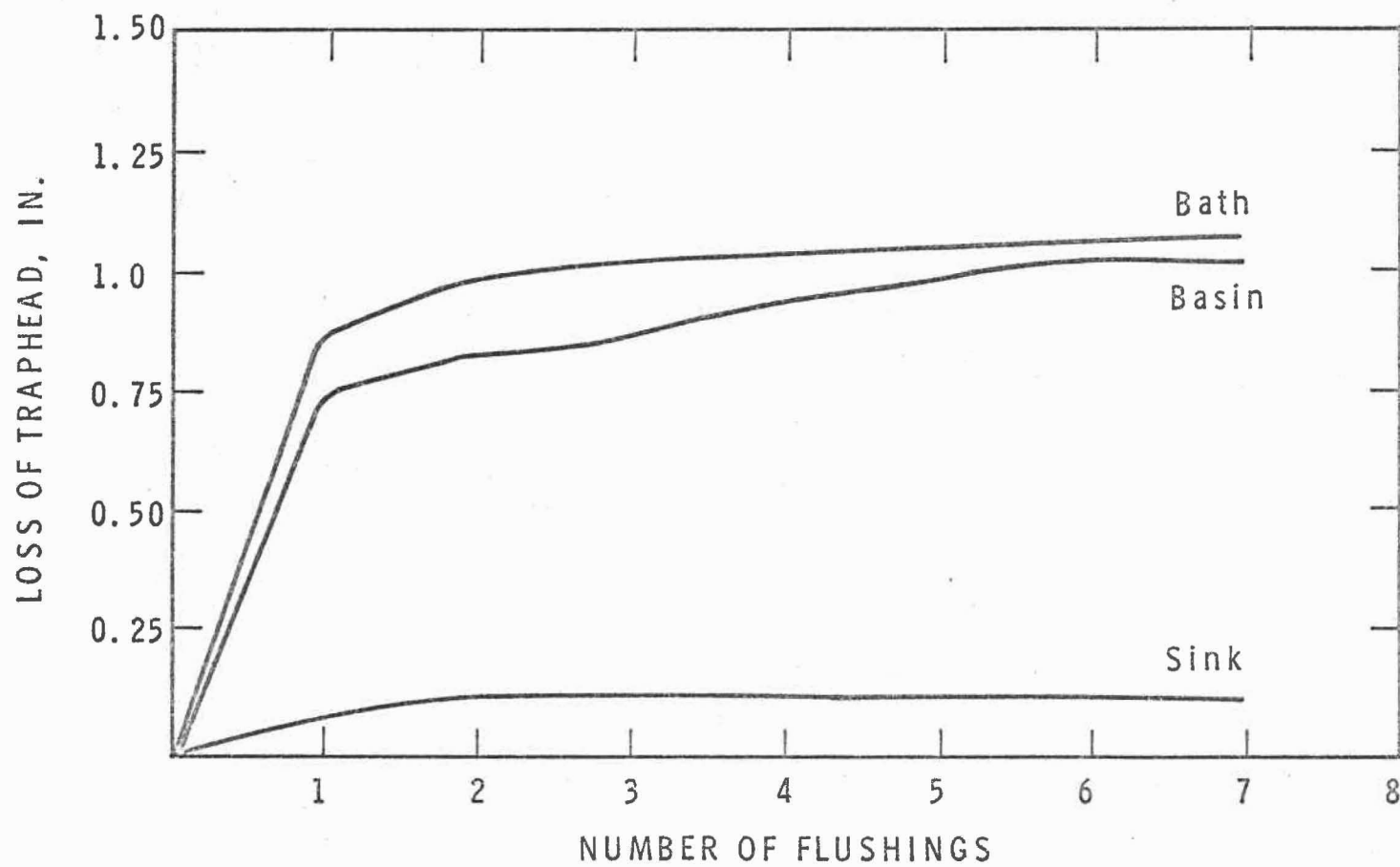


FIGURE 5
REPEATED FLUSHINGS OF TOILET. NO VENTING

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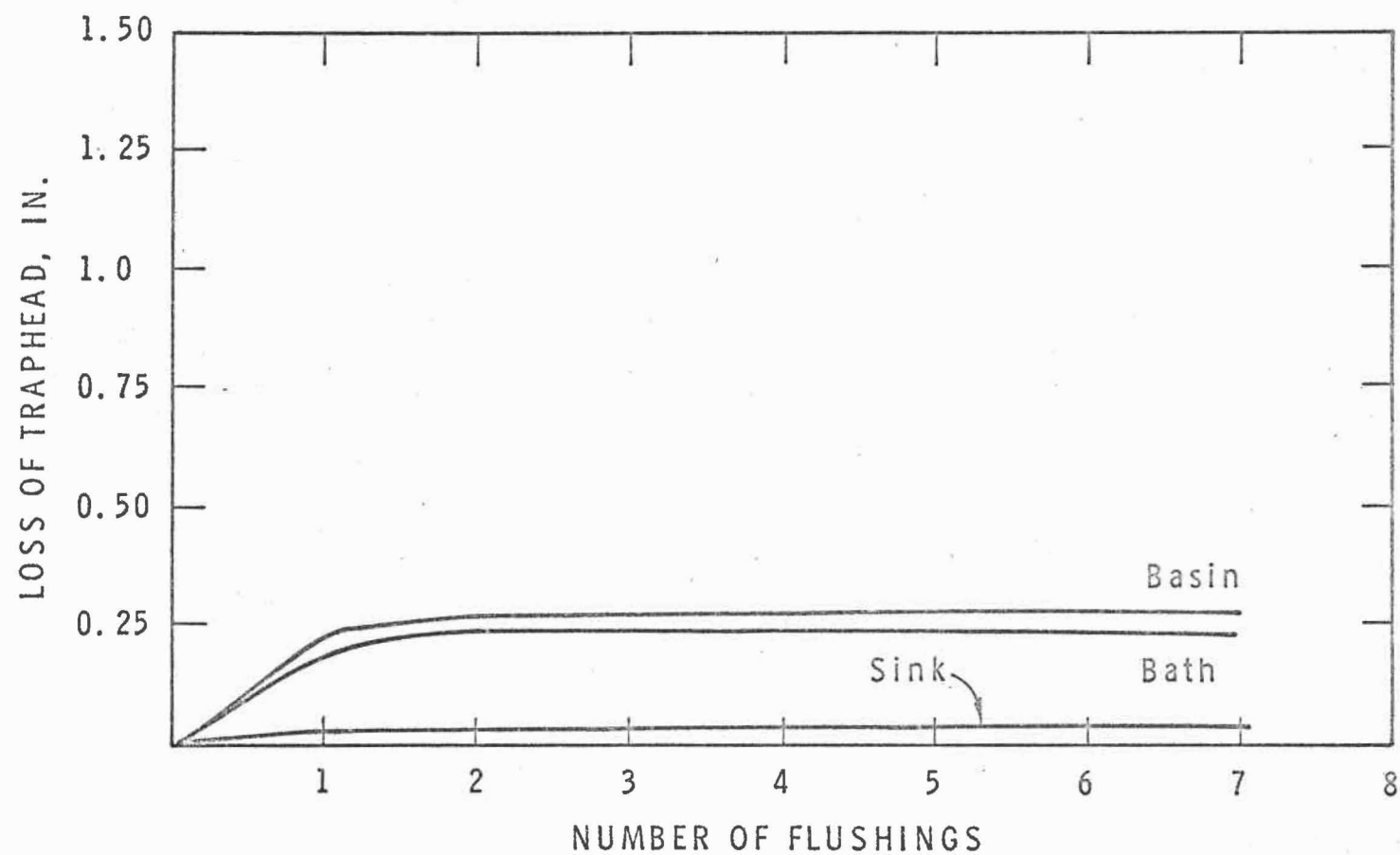


FIGURE 6
REPEATED FLUSHINGS OF TOILET. ONE INCH VENTING

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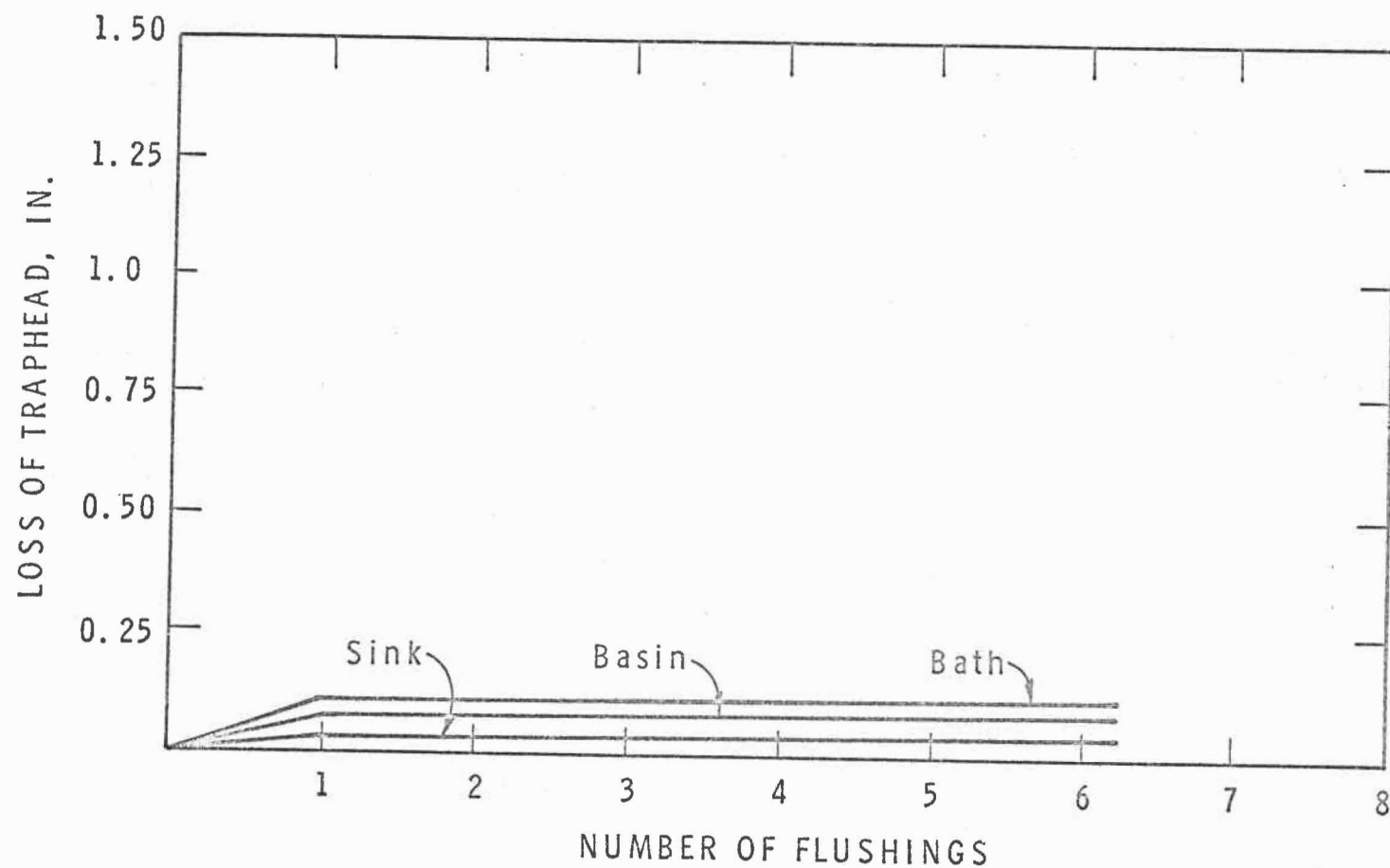


FIGURE 7
REPEATED FLUSHINGS OF TOILET. TWO INCH VENTING

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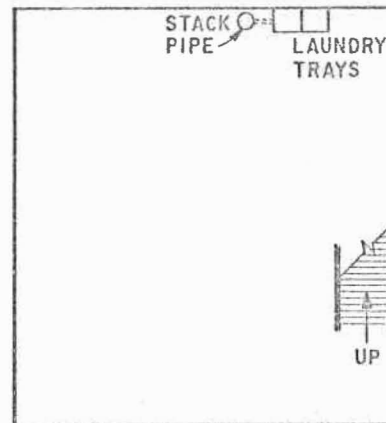
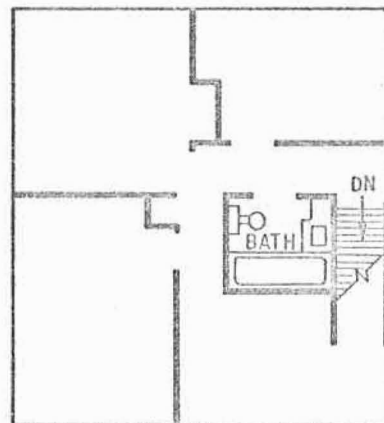
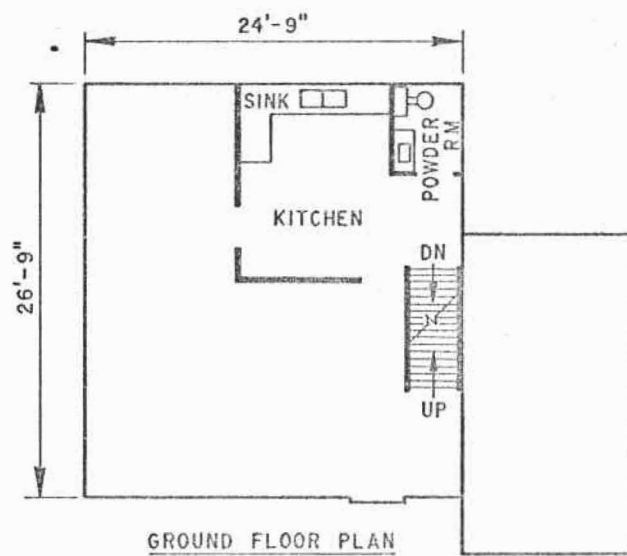


FIGURE 8
FLOOR PLANS, MARK VI HOUSE

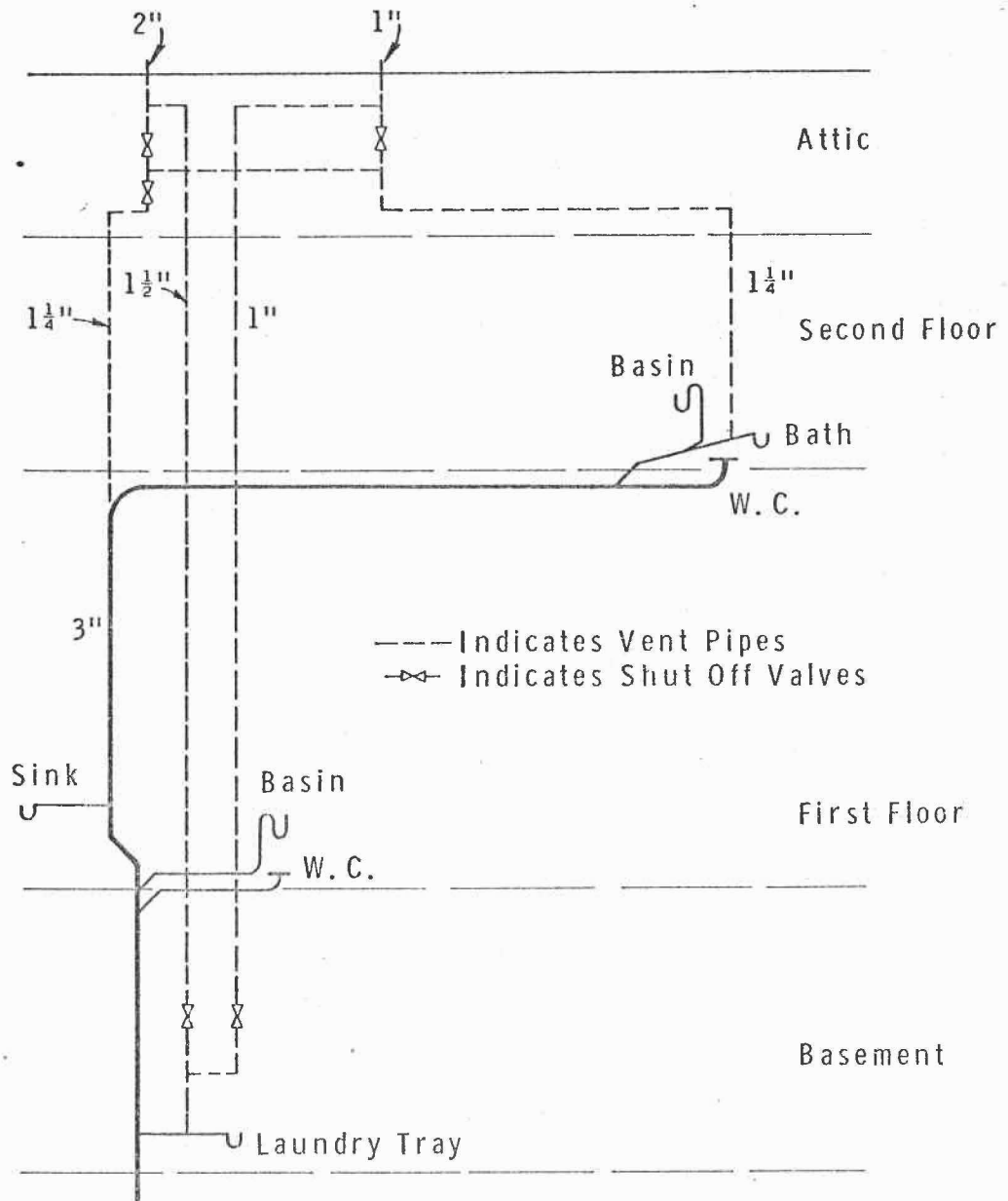


FIGURE 9 OUTLINE SHOWING WASTE & VENT

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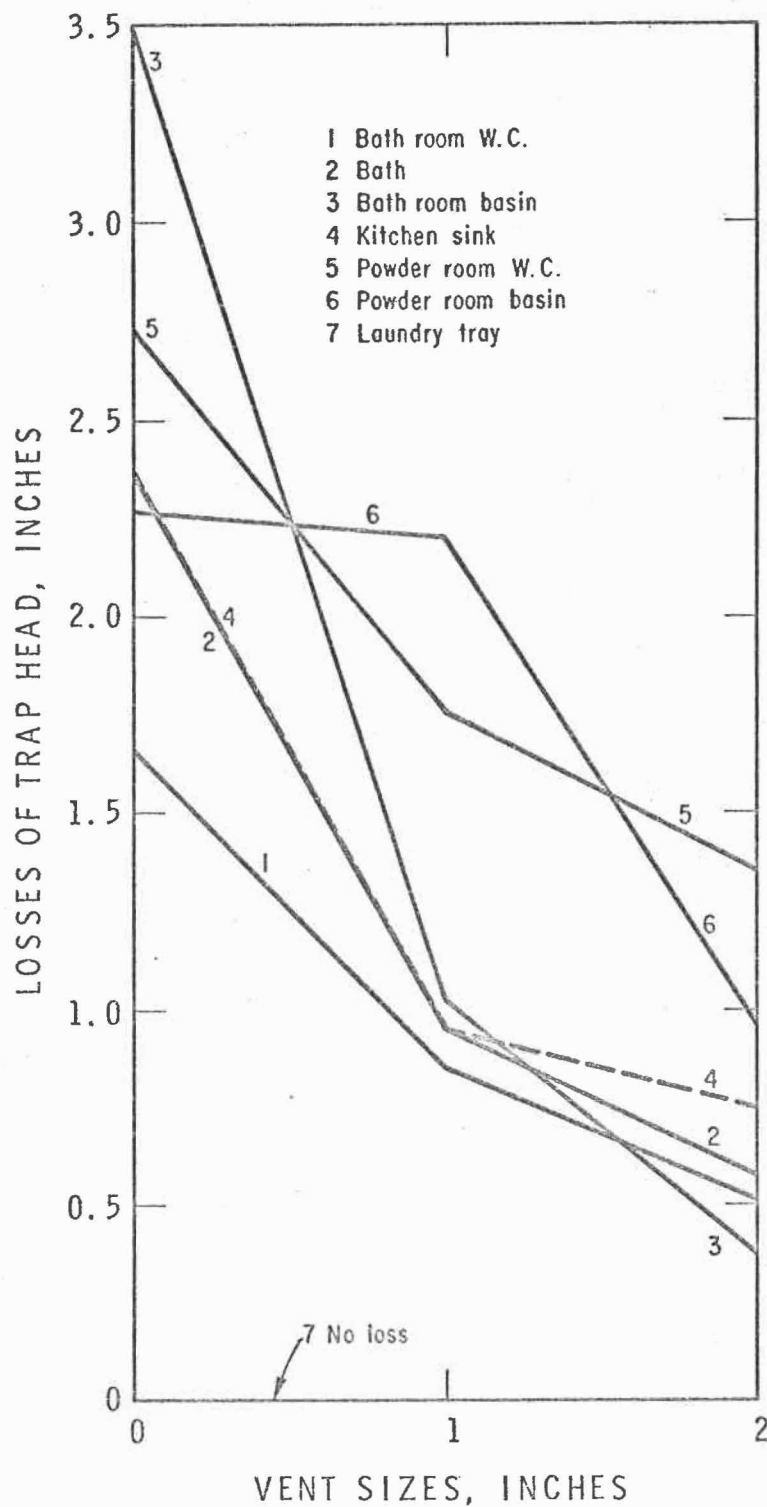


FIGURE 10

MAXIMUM TRAP SEAL LOSS RESULTS OF VENTING ON EACH UNIT WITH ALL OTHER FIXTURES OPERATING

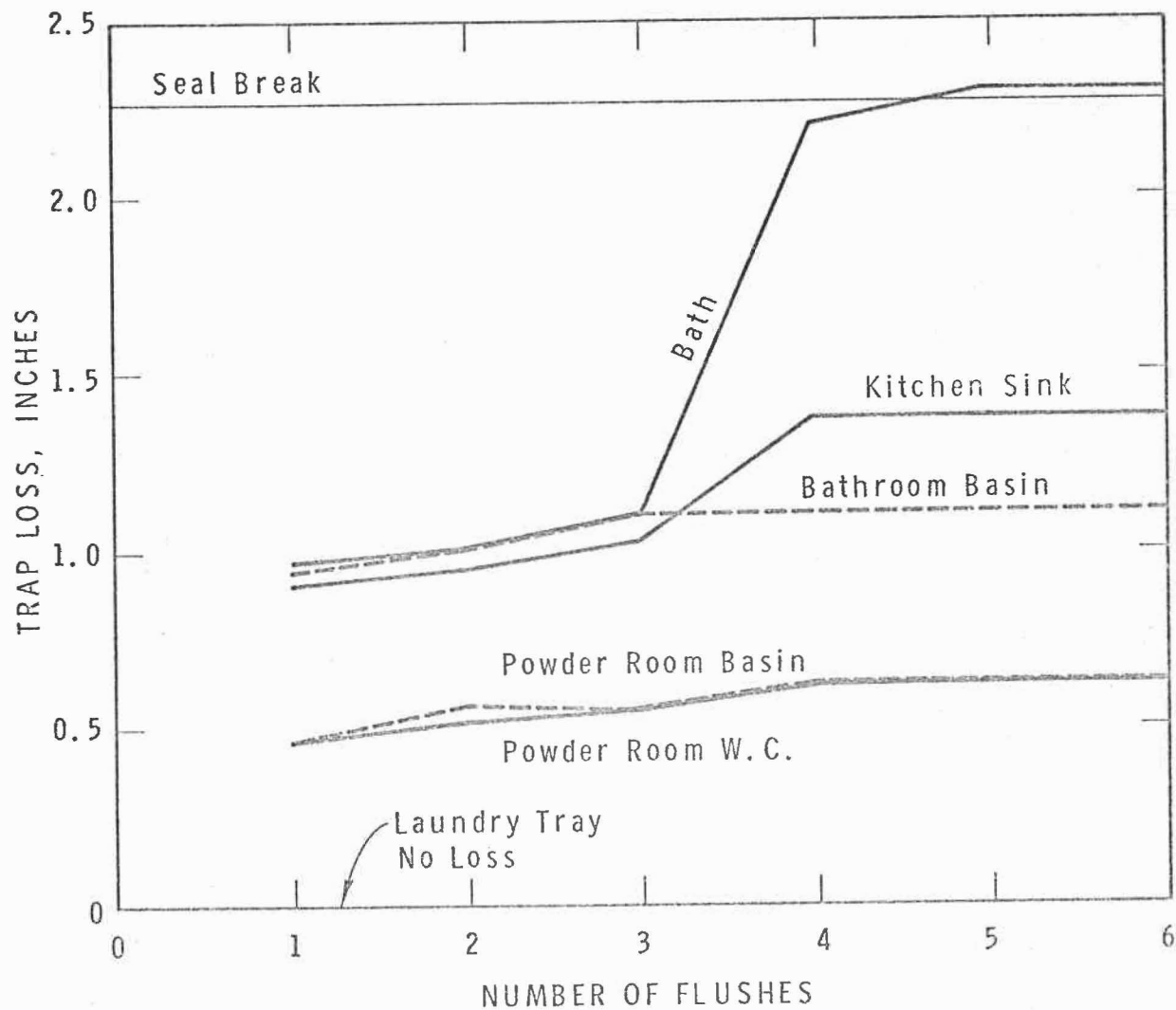


FIGURE II
REPEATED FLUSHING OF BATHROOM TOILET (NO VENT)

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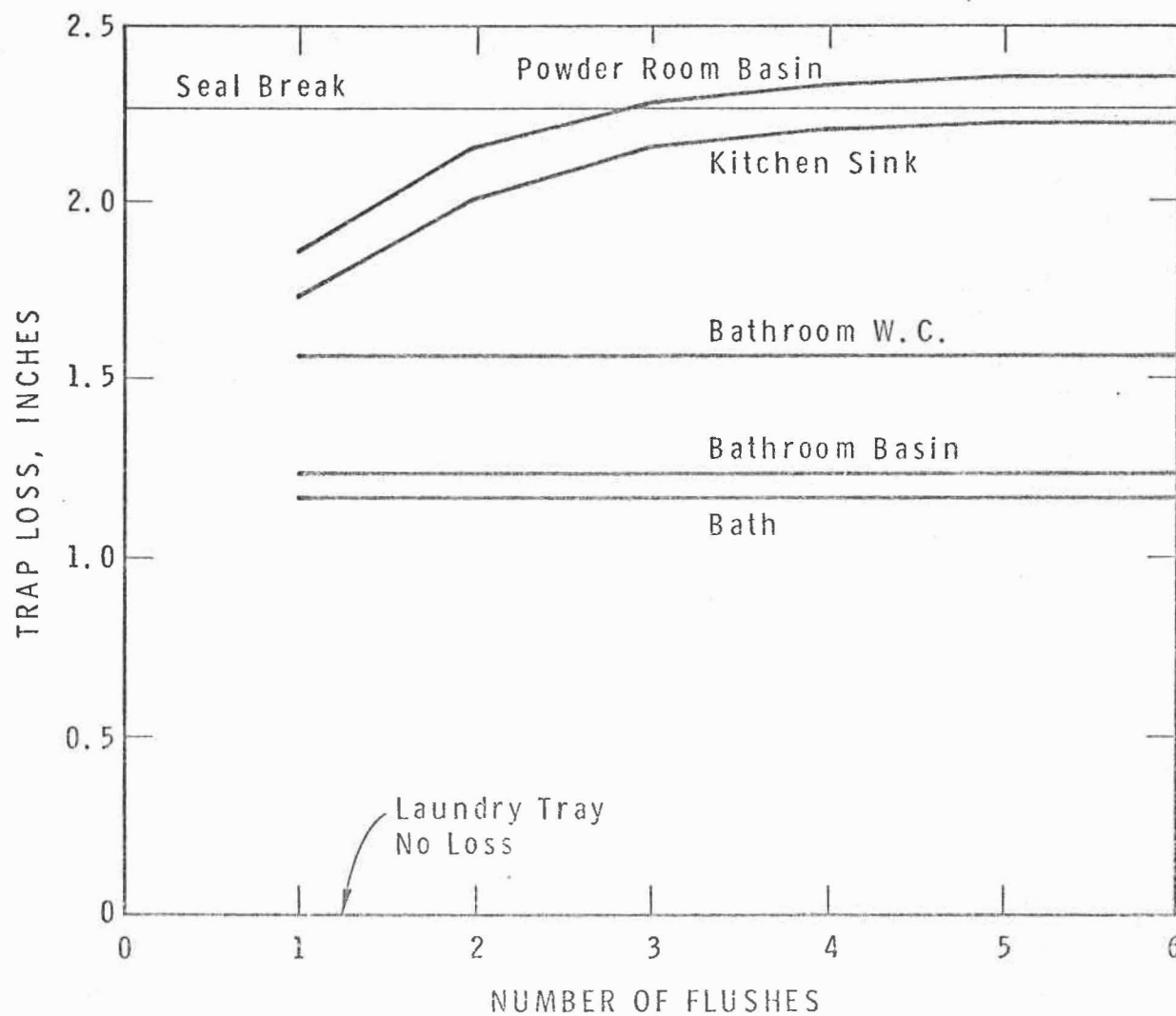


FIGURE 12
REPEATED FLUSHING OF POWDER ROOM TOILET (NO VENT)

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